Mobile Agents

NASA Ames Research Center Computational Sciences Division

Mobile Agents is the name of a NASA-funded project that includes teams from multiple research disciplines inside and outside NASA developing and testing a complex software and hardware infrastructure to support humans and robots conducting science exploration on extra-terrestrial surfaces such as the moon and Mars.

The overall aim of the project is to develop a complete human-machine work system that can support people living and working on other planets and assist distributed science and operations teams working anywhere on Earth.

This means that we research and develop support for all aspects of working and living on planetary surfaces--from collaborative planning of extra-vehicular activities (EVA) on the planet's surface to collaborative analysis of science data on Earth, capturing of science data using science instruments and cameras, and monitoring of both an EVA plan and an EVA astronaut's health during an EVA.

We also assist in the coordination of human-robot teams, allowing the astronauts to interact using natural language to perform their work with robots, and we support autonomous plan execution for the robots and robot team coordination. To allow all the distributed software and hardware components that we refer to as Mobile Agents to interact, we are developing and testing long-range wireless networks for planetary exploration, including communication back to Earth using the Internet.

The Mobile Agents system was tested with hardware in 2003 and 2004 during two-week field tests inside and outside the Mars Desert Research Station (MDRS) in the Utah desert. Inside the MDRS habitat a set of software agents served as the central coordination, communication and storage facility integrated with software systems previously developed to store science data, and allow distributed teams to collaborate asynchronously.

Mobile Agents Collaborators

Hardware and software components that are part of the Mobile Agents Architecture include Brahms, Mobile Exploration System (MEX) wireless network infrastructure, ScienceOrganizer, RIALST speech recognition system and NASA Research and Education Network (NREN) satellite communications, all by NASA's Ames Research Center and Glenn Research Center; the EVA Robot Assistant (ERA) by NASA Johnson Space Center; Compendium by Verizon Communications and the United Kingdom's Open University; and the KAoS agent communication framework by the Institute for the Interdisciplinary Study of Human & Machine Cognition (IHMC).

Contact:
Bill Clancey William.J.Clancey@nasa.gov
Maarten Sierhuis msierhuis@mail.arc.nasa.gov
http://ic.arc.nasa.gov